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D.F. Wentworth J.K. Couchman J.C. MacBean A. Stecher

Examining Your Environment

Ecology in Your Community

A GUIDE FOR TEACHERS

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Examining Your Environment

Ecology in Your Community

A GUIDE FOR TEACHERS

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INTRODUCTION

There can be no doubt that ecology is important in the world of today. The news media constantly bombard us with descriptions of oil spillage, energy crisis, air and water pollution, food shortage, fears of overpopulation, the deteriorating quality of life. These problems are both real and complex, so much so that they confuse adults as well as pupils.

What is ecology all about? How can we bring an understanding of ecology to pupils? How can the scope of ecology be presented in one short textbook? In this book, *Ecology in Your Community,* the pupils are provided with a brief overview of the major ideas in ecology, sufficient to give some insight into what ecology deals with. The everyday experience and knowledge of the pupils are tapped and connected to the ecology of their neighborhoods. The activities cannot, in such a casual treatment, probe deeply into ecological studies but they do open doors to a better understanding of ecology. Pupils can be encouraged to pursue topics that are of particular interest to them.

In Chapter 2 the pupils are made aware in some detail about the proper way to conduct one kind of experiment. The teacher should help the pupils to follow these steps whenever possible.

This book deals with a number of terms and concepts vital to an understanding of ecology. These are: interrelationship, populations, community, adaptation, succession.

The activities in this book can bring home to the pupils that ecology is not something far removed from them. They can be led to see that it affects their lives and that it can be studied purposefully in their own home and school neighborhoods.

Selecting Activities

The chapters in *Ecology in Your Community* should be done in the order in which they are presented since what is learned in one chapter will help in understanding the one that follows. Since the activities within each chapter follow a logical sequence it is best to stick to this sequence.

In most cases the outdoor activities can be done in the spring, summer or fall. Many are best done in the early fall which is an ideal time for teaching this topic.

Guiding Student Inquiry

Some of the photographs in the student's text show boys and girls doing investigations. These photographs illustrate techniques that might otherwise be difficult to understand. The captions usually provide questions that guide the students to interpret the main ideas and draw attention to subtleties of technique. Other photographs illustrate phenomena related to the problems that the students will be investigating.

Before attempting each activity, you might direct your students to read the captions carefully. By discussing the photographs and captions in small groups or as a class, your pupils can gain insight to the content of the chapter. Hopefully, some photographs will stimulate questions that will lead to activities that the students themselves devise and conduct. When this happens, your students have progressed to the threshold of open-ended inquiry, the most desirable type of learning experience. The quality of these open-ended investigations will depend on the skills developed from more directed activities and on your ability to provide guidance at critical times.

Diagrams, charts, graphs, and drawings are included to guide the students in conducting their activities or to help them in recording their data. Encourage the students to use these aids. Discussion of these illustrations by students in small groups can help clarify the ideas presented in the activities.

To organize your classroom, you might set up several learning stations with different activities from the same chapter. The equipment and materials necessary for each activity should be readily available at each station or elsewhere in the classroom. The books, open at the appropriate pages, can be used as work cards. You might find it necessary to organize data-collecting sheets for the students. Some type of rotation can also be employed to take best advantage of the learning stations. For other suggestions, refer to the series overview, *Examining Your Environment, An Introduction for Teachers*, pages 31 to 37.

The sequence of steps for carrying out an activity might be:

1. The students could read the activity carefully and organize themselves to conduct the investigation from beginning to end.
2. Pupils could invite you to their group and outline their plans for your approval and revision, if necessary.
3. They could conduct the investigation.
4. The students could answer the *Digging Deeper* questions and the appropriate values clarification activities suggested in this guide.
5. A reporting session can be organized so that you can gather feedback on how well the groups have progressed. The students then have a chance to report and compare their findings with other students. New avenues of investigation, as well as skill teaching and reteaching, can grow out of this reporting session.

Once the students have completed the initial investigations as a class endeavor, you might invite them to pursue new investigations. For this, you could organize the students into groups. Each group could leaf through the activities in the rest of the chapter and decide which one they wish to pursue. It will be interesting for you to see how the students make this decision. There may be implications for teaching some group interaction processes. (See *Examining Your Environment, An Introduction for Teacher,* for more information on this aspect of teaching.)

Capitalize on students' questions arising out of the activity that has just been completed and guide the students to devise their own activities to answer their questions. The students will require a great deal of help when they first attempt to organize their own investigations. Try to be patient and helpful, but hold them accountable for the skills that have just learned.

How to Use this Guide

Each teacher's guide corresponds to a book in the *Examining Your Environment* series. Every activity is analysed under several headings. When using the guidebooks, you should first read the activity in the text, as this background will help you to understand the references under the follow headings.

TIME
The estimated time needed to complete the activity under normal circumstances is stated under this heading.

SEASON
Under this heading, the most suitable seasons for carrying out the activity are considered. Whether the activity is to take place indoors or outdoors is also indicated.

CLASS ORGANIZATION
Here hints are given as to the ideal number of pupils that could perform an activity. This does not mean that more than one group could not try the same activity, if this is practical. Some activities are recommended for the whole class; other activities, for smaller groups.

EQUIPMENT AND MATERIALS
Listed here are the majority of the items that will be required for each group to complete the activity.

SKILLS AND TECHNIQUES
This column lists the main skills and techniques a student will need to carry out an activity. These items could form the instructional objectives for the activity and be the criteria for most of the evaluation to follow. The information under this heading provides insight into items that may require preteaching or review.

CONCEPTS
As a result of completing the activities, the child should have gained some general knowledge. Only the major concepts have been listed. Often, they have been expressed in general terms and may be oversimplified.

SUGGESTIONS FOR VALUE TEACHING
Under this heading you will find value clarification statements or questions that you could use to guide the students to determine what the activity means to them. Of course, you will, no doubt, have your own ideas as to the type of exercises that will encourage your students to gain greater meaning from their studies, and you should use your thoughts to augment the suggested ones.

CLUES TO QUESTIONS

Because the answers often relate directly to the data collected, many of the answers to the questions in the *Digging Deeper* sections will depend upon the circumstances. Some of the factors that might be considered in answering a question have been listed.

TROUBLE SHOOTING

Under this heading is a checklist of items that are useful in guiding pupils during the activity. Some of these items may account for the success or failure of an activity.

RESOURCES

Both the text and the bibliography contain suggestions for obtaining special materials when they are required. Under this heading are listed *other* possible sources of ideas and supplies.

CROSS REFERENCES

When a skill or piece of apparatus has been employed in a different book of the *Examining Your Environment* series, reference to the activity is made. This will be useful to the teacher who wants students to further develop particular skills through another similar activity.

1. ABOUT ECOLOGY

Activity 1:
What is ecology?

TIME
two 30-minute periods
the first period for independent pupil study and investigation; the second period for classroom discussion of the pupils' own thinking and the results derived from talking to friends and adults

SEASON
any time of year, but preferably spring, summer, or fall

CLASS ORGANIZATION
individual pupil work followed by discussion involving the entire class

EQUIPMENT AND MATERIALS
paper
pencil

SKILLS AND TECHNIQUES
- interpreting photographs so as to discover ecology ideas
- interviewing to solicit opinions
- using the dictionary
- drawing a cartoon

CONCEPTS
People often have a vague, confused idea of what ecology means.
Sharing ideas with other people can produce a broader understanding of what people want and of how they think.
Photographs can convey ecology ideas.

SUGGESTIONS FOR VALUE TEACHING

Look at the Peanuts cartoon on the Introduction page. Have you ever felt like Charlie Brown and Lucy? Make a list of some of the things going on in this world that are hard to understand and thus hard to have ideas about? How many of these things have to do with ecology? Return to these ecological concerns periodically during your study of ecology to see if you are gaining some new ideas about them.

CLUES TO QUESTIONS
The pupils should be encouraged to express freely their present understanding of words such as ecology, environment, pollution, etc., and also their interpretations of the photographs. They can, themselves, discover the rather vague understanding about ecology that exists. They may be motivated to clarify their own understandings.

TROUBLE SHOOTING
- Emphasize the need for each pupil's ideas and suggest that he/she record these before his/her discussion with others and before classroom discussion.
- Encourage the pupil to put his/her present thinking on paper.

VOCABULARY

ecology	*conservation*
balance of nature	*pollution*
teeter-totter	*natural resources*
environment	*energy crisis*
interrelationships	

RESOURCES
school and public librarians

CROSS REFERENCES
Mini-climates, general introduction and introduction to each chapter.

Branching Out:

TIME
a long-term activity

SEASON
anytime

CLASS ORGANIZATION
individuals working at home

EQUIPMENT AND MATERIALS
newspapers
magazines
scrapbook

SKILLS AND TECHNIQUES
- analysing newspaper headlines
- reading newspapers and magazines for a purpose
- looking at television commercials more critically and purposefully
- organizing and maintaing a scrapbook
- inferring the ecological aspects of work done by community workers

CONCEPTS

Newspapers and magazines contain many articles dealing with current ecological concerns.

Television commercials often stress ecological ideas.

Many people in the community work at jobs associated with ecology.

Investigating daily happenings related to ecology can broaden our understanding of ecology.

SUGGESTIONS FOR VALUE TEACHING

Did you make any changes to the definition of ecology that you wrote in Activity 1? If so, why did you make these changes? If not, why didn't you make changes? What might your willingness or unwillingness to change your definition show about your attitude toward learning?

CLUES TO QUESTIONS

From time to time important newspaper and magazine articles on ecology should be discussed in class.

TROUBLE SHOOTING

- The pupils should be taught how to organize and maintain a scrapbook.
- The teacher should have the scrapbooks shown at regular intervals and key articles discussed. This will encourage the pupils to continue their reading of newspapers and magazines.

VOCABULARY

living
nonliving

RESOURCES

school and public library

Activity 2:
What can you find in your neighborhood that has to do with ecology?

TIME

30 minutes to allow the pupils to examine the photographs, record their ideas and discuss their ideas with the other members of the class

SEASON

anytime

CLASS ORGANIZATION

pupils working as individuals followed by class discussion

EQUIPMENT AND MATERIALS

paper
pencils
photographs on page 5

SKILLS AND TECHNIQUES

- finding a main idea in a photograph - exercising judgment
- examining photographs to discover something new about ecology
- writing complete sentences
- developing an awareness of the neighborhood as an ecology resource

CONCEPTS

A photograph can be used to illustrate many ecological ideas.

Ecological ideas can be found associated with many rather ordinary places and situations in our neighborhoods.

CLUES TO QUESTIONS

To get the pupils started, have all of the pupils examine the art photograph and discuss the range of possible ecological ideas associated with it. Try to expand the number of ideas beyond the three provided in the textbook. Encourage the pupils to think freely.

TROUBLE SHOOTING

- Prior to having the pupils work independently, it may be advisable to discuss with them what the pictures are about - e.g., identification of the animals, plants, environment, etc.

VOCABULARY

habitat
neighborhood

Activity 3:
Why is ecology important?

TIME

45 minutes

SEASON

anytime

CLASS ORGANIZATION

pupils working individually followed by class discussion

EQUIPMENT AND MATERIALS

paper
pencil
photographs in this activity (pages 6-8)

SKILLS AND TECHNIQUES

- selecting an ecologically-based alternative from two alternatives that might appear equally acceptable
- recording ideas in coherent sentences

CONCEPTS

Although two courses of action may appear equally proper, the ecological implications may differ considerably.
Heavy use of herbicides can harm insects and birds.
Unless care is exercised by cat owners the cat population can grow too large.
Green belts between cultivated fields provide a home for many wild plants and animals.
Green belts are attractive areas.
Excessive concern for economy can destroy the ecology of an area.
It sometimes costs more money to follow procedures that are ecologically desirable.
Garbage in plastic bags decays more slowly than garbage wrapped only in paper.
Excessive pollution from factories can prevent animals and plants from living in the vicinity of the factories.

SUGGESTIONS FOR VALUE TEACHING

Mark your position on the following scale.

Eco-Eddy wonders about everything he does and what effect these actions have on his environment.	Convenient Connie does anything that will make her more comfortable. She feels confident that the environment can take care of itself.

|_____|_____|_____|_____|_____|

Your position on the scale will tend to indicate your awareness of the importance of ecology. Compare your position to that of other students. Discuss the reasons for your position. Return to the scale periodically to see if you want to change your position as you conduct other activities in this book.

CLUES TO QUESTIONS

This is largely a decision-making exercise. Two alternatives are shown in each case. Each alternative has merit. In each case, however, one alternative is more desirable ecologically. In classroom discussion the ecological aspects should be stressed. The *Branching Out* section contains an activity that will help to consolidate the ideas presented in this chapter.

TROUBLE SHOOTING

- Since this is a decision-making exercise there may be a considerable difference of opinion among the pupils even after the discussion is completed. The teacher should avoid at this time attempting to arrive at a fixed position concerning bad and good alternatives.
- This activity will have achieved its objective if it gets the pupils thinking seriously about the problem.

VOCABULARY

community	*cultivate*
rural	*green belt*

2. WHAT'S AROUND YOU?

Activity 1:
What makes up your environment?

TIME

one hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

pupils work individually and then share their information with the entire class

EQUIPMENT AND MATERIALS

paper
pencil

SKILLS AND TECHNIQUES

- exercising the use of one's senses
- observing critically the items that make up one's environment

- inferring the needed items in the environments of other living things
- recording data in chart form

CONCEPTS

The environment is made up of a variety of things such as air, people, plants, etc.

The same things are found in many different environments.

Many items in our environment are overlooked because they are so common.

The items in our environment may change with the seasons.

Many of the items in our environment are necessary for life.

Different living things require different items in their environment in order to live.

SUGGESTIONS FOR VALUE TEACHING

Read the Peanuts cartoon on page 10. Do you agree with Sally? Could Sally have other reasons for saying that Linus is wonderful? Name some of them. Would you like to know more about ecology? Why? Habitat is a new word in this chapter and more new words will appear in the chapters and activities to come. What can you do to learn these words so that you can be as smart as Linus and "Know EVERYTHING"?

CLUES TO QUESTIONS

During the class discussion, the pupils should be encouraged to add items to their charts to produce a comprehensive listing of items.

In the classroom discussions emphasize those items that are necessary for life. For example, pure air, water, food, space, heat, light, etc.

The activities in the *Branching Out* section provide opportunities to develop a better understanding of our environment.

TROUBLE SHOOTING

- Explain carefully how the information is to be recorded so that the time spent both indoors and outdoors is profitably used. A time limit should be clearly established for recording the observations.
- A list of items in the classroom environment should be developed cooperatively with the pupils before they attempt to observe and record outdoors and at home.

VOCABULARY

environment
habitat
hibernate
migrate
living
nonliving

RESOURCES

librarian
film "Cry of the Marsh"

Activity 2:
How can we set up a water environment?

TIME

45 minutes to set up the nonliving parts of the aquarium
30 minutes to set up the living parts of the aquarium

SEASON

anytime

CLASS ORGANIZATION

pupils working in groups of four or five, each group setting up one aquarium

EQUIPMENT AND MATERIALS

For each group:
large clear glass jar with a wide mouth
half a pail of coarse sand
aquarium gravel
dishpan
sieve
white paper
scissors
guppies - one male, one female
4 water plants - elodea or eel grass, duckweed
4 water snails
tropical fish food
piece of glass

SKILLS AND TECHNIQUES

- carrying out step-by-step instructions carefully
- organizing so as to have all of the necessary materials readily available
- preparing a suitable label for the aquarium
- identifying guppies, snails, and some common water plants
- purchasing items from a pet store

CONCEPTS

The aquarium is balanced when the fish, snails, and plants can survive without anything extra such as food being placed in it.

Soap or detergent can be harmful to plants and animals.

To reduce risk of disease, cleanliness is important when setting up an aquarium.

Fish should be acclimatized slowly to the aquarium water to reduce the possibility of illness.

Too much fish food can be harmful to the fish because it can pollute the water.

Direct sunlight can be harmful to the living things in an aquarium because it promotes the growth of algae.

SUGGESTIONS FOR VALUE TEACHING

During this activity you have constructed an inexpensive aquarium. Mark your position on the scale to show how you feel about making things.

Tom Thumb avoids making things because his projects never work out. He spends a lot of money buying things.

Handy Harriet would rather make something than buy it ready-made because she feels better satisfied when she has done the thinking and the work.

Compare your position with that of your group members. Give the reasons for your position.

CLUES TO QUESTIONS

In order to prevent excessive heating of the water and overdevelopment of algae, keep the aquarium out of direct sunlight.

If holes are punched in the cover, outside air, dust, etc. can enter the aquarium freely.

Soap and detergent can harm the living things in the aquarium.

The plants, animals and nonliving things are all necessary to make a complete environment.

Each group of pupils might be encouraged to make their aquarium somewhat different from the others.

As suggested in the *Branching Out* section, a pet store clerk can help you set up a live food tank such as a brine shrimp tank. Periodic feeding of live food will introduce students to predation as well as provide variety for the diet of the fish.

TROUBLE SHOOTING

- Be certain that all of the necessary items are at hand before the lesson starts.
- The pupils should study and discuss the steps in setting up the aquarium prior to starting at it.
- It may be possible to obtain the plants, snails and fish without charge from a person in the school community who has an established aquarium.
- Avoid having the plants and fish "lying around" for too long a time while the aquarium is being built. They are quite fragile and can easily die.

VOCABULARY

aquarium
detergent
chemicals
furrow
guppy
elodea
eel grass
duckweed

RESOURCES

local pet shop
local pond

Activity 3:
What can be found in the water environment of your aquarium?

TIME

30 minutes

SEASON

anytime

CLASS ORGANIZATION

pupils work in groups of four or five and later discuss their findings with the remainder of the class

EQUIPMENT AND MATERIALS

For each group:
pencil
paper

SKILLS AND TECHNIQUES

- recognizing that living things in an aquarium live in groups
- distinguishing between living and nonliving things
- developing observational skills
- recording in chart form
- examining photographs to broaden understanding of living and nonliving things in a water environment

CONCEPTS

Living things can be studied in groups or populations as well as individually.
Many different living things can be found in an environment.
Many nonliving things are necessary in an environment if living things are to exist.
The nonliving things in an environment are not always easily detected.

SUGGESTIONS FOR VALUE TEACHING

Think about the activity that you have just finished. Share your ideas by answering these questions:

1. *On the whole I thought this activity was: (circle one)*

very poor	poor	fair	good	very good	excellent

2. *The strengths of the activity were:*
____
3. *The weaknesses of the activity were:*
____
4. *The activity would have been better if:*
____
5. *During the next activity, I would like to see us:* ____________________

CLUES TO QUESTIONS

The variety and numbers of living things will not be large immediately after the aquarium is set up. As time passes these numbers should increase.
It is desirable to repeat the observations several weeks later and to compare the results.

The *Branching Out* section will help students apply their new ideas to the larger world.

TROUBLE SHOOTING

- Since not all of the nonliving things in the environment are visible, discussion will be necessary to indicate that they are indeed present.

VOCABULARY

ecosystem
population

Activity 4:
How is a race like an experiment?

TIME

45 minutes

SEASON

anytime

CLASS ORGANIZATION

pupils working in groups of four or five with provision for discussion involving the entire class

EQUIPMENT AND MATERIALS

For each group:
2 identical toy cars except for difference in color
2 identical wooden ramps
books to elevate one end of the ramps
stopwatch or a watch with a sweep second hand
paper
pencil

SKILLS AND TECHNIQUES

- timing the speed required for the cars to reach the finish
- learning how to conduct an experiment - identifying the steps
- identifying problems
- determining measurement needs
- recognizing the different things that can affect an experiment
- observing carefully
- recording results

CONCEPTS

In one kind of experiment two situations are compared where all things are the same except one.
An experiment starts with a problem which is clearly stated.
A carefully carried out experiment can provide reliable results.

SUGGESTIONS FOR VALUE TEACHING

Conducting an experiment is one way to find an answer to a question. Make a list of other ways to learn things. The word "experiment" should be in your list along with at least five other ways. Rank order the ways in which you prefer to learn by placing a "1" beside the one you most prefer and a "5" or "6" beside the ways that do not work for you. Explain your rank ordering to your group members.

CLUES TO QUESTIONS

Only one thing at a time should be changed when doing an experiment. All other things must remain the same.

In summary the steps of an experiment are: (See *Branching Out* section.)

1. Identify a problem.
2. Decide what is to be measured.
3. Decide how it is to be measured.
4. Determine one thing that will be changed.
5. Connect the original problem with this change.
6. Consider all things that might affect the result.
7. Do the experiment.
8. Record the observations with a number whenever possible.
9. Write the results in sentence form.
10. Repeat the experiment to compare results.

TROUBLE SHOOTING

- Using a race should help the pupils to get the idea of the steps in an experiment. Care must be taken, nevertheless, to develop carefully the step-by-step process of an experiment as the pupils conduct the race.

It is wise to work through the steps with the entire class before each group attempts the activity. The experiment can be repeated changing a different thing each time.

VOCABULARY

fair
experiment
force
reliable
stopwatch
result

CROSS REFERENCES

Small Creatures, Chapter 2.

Activity 5:
How is an experiment carried out in ecology?

TIME

two 20-minute periods

one period to start the experiment and the second period, seven days later, when observations are made and results determined

SEASON

anytime

CLASS ORGANIZATION

entire class working cooperatively

EQUIPMENT AND MATERIALS

2 large bottle aquariums that are alike
1 bottle lid
paper
pencil

SKILLS AND TECHNIQUES

- carrying out the steps of an experiment
- recognizing problems
- determining measurement needs
- recognizing different things that affect an experiment
- observing carefully
- recording results

CONCEPTS

Water evaporates more readily from an open container than from a closed container. Properly carried out, experiments provide reliable results.

SUGGESTIONS FOR VALUE TEACHING

Conducting experiments in ecology often means experimenting with living things. Mark your position on the following scale.

Leave-Alone Lennie believes that all life is sacred. He does not eat meat, swat flies and wouldn't think of experimenting with living things.

Scientific Sam believes that the only way to improve life for people is to experiment on all living things including people.

Discuss the reasons for your position with your group members.

CLUES TO QUESTIONS
The level of the water in both aquariums is measured at the beginning of the experiment and again seven days later. The pupils will see that the water level in the open aquarium has lowed considerably while in the closed aquarium the water level remained the same.
Some things that might affect what is being measured are temperature, wind, location and size of aquarium. Can you think of others?
The students should be encouraged to attempt the *Branching Out* section since it requires them to devise an experiment using all of the steps introduced previously. You might use the results as an evaluation of student progress.

TROUBLE SHOOTING
- It is important that the teacher work carefully through the step-by-step thinking process with the pupils.
- The pupils will have to get accustomed to the realization that properly conducted experiments frequently require the passage of considerable time before the results are obtained.
- Two identical aquariums should have been set up some time prior to this experiment.

VOCABULARY
aluminum foil

CROSS REFERENCES
Small Creatures, Chapter 2.

Activity 6:
What are some other types of habitats?

TIME
45 minutes

SEASON
anytime

CLASS ORGANIZATION
pupils work individually and then discuss their work with the class

EQUIPMENT AND MATERIALS
paper
pencil
photographs of this activity

SKILLS AND TECHNIQUES
- identifying different kinds of habitat from photographs
- distinguishing between living and non-living things
- recording information in chart form
- inferring the results of change

CONCEPTS
There are many types of habitats.
Various habitats contain living and non-living things.
Habitats can be identified by where they are located, for example, stream, garden, lawn, etc.

SUGGESTIONS FOR VALUE TEACHING
See the Branching Out section of this activity.

CLUES TO QUESTIONS
Most living things can survive in a particular environment only if conditions do not change too much. If conditions are changed drastically the living thing will either die or locate elsewhere where conditions are more favorable.

TROUBLE SHOOTING
Class discussion is important to clarify the names of habitats and to develop a growing understanding of the living and nonliving things found in each habitat.

VOCABULARY
community
habitat
pollution

RESOURCES
librarian

CROSS REFERENCES
Mini-climates (all chapters).
Pollution (all chapters, especially Chapters 1 and 2).

3. PLACES AND NUMBERS

Activity 1:
What makes up your community?

TIME
one 45-minute period indoors
one 45-minute period outdoors examining communities
one 45-minute period discussing the results of the outdoor study

SEASON
spring, summer, or fall

CLASS ORGANIZATION
Pupils work individually or in small groups while they examine their own large community and the several smaller communities within the larger one. The entire class discusses the findings.

EQUIPMENT AND MATERIALS
maps
paper
pencil

SKILLS AND TECHNIQUES
- using a map
- listing the kinds of buildings and kinds of workers
- interpreting photographs
- recording in chart form
- observing the animal populations, plant populations, and conditions of a community

CONCEPTS
A community is the groups of plants and animals that live in the same area.
Smaller communities can be found within larger communities.
Boundaries can be established for a community.
Each community contains its own particular animal and plant populations and has its living conditions.

SUGGESTIONS FOR VALUE TEACHING

Study the sixteen photographs of communities on pages 26 to 29. Rank order them in terms of how you feel about each community as a place to live. (Give a "1" for your first choice down to "16" for the one you like least.) Compare your rank order with the order of your classmates. What does the expression, "The grass is always greener on the other side." mean? Does this expression apply to you and your rank ordering?

CLUES TO QUESTIONS
The glossary in the textbook should be consulted for the meanings of ecology terms such as community and environment.
The size of a community can be as small as a tree stump or as large as thousands of square kilometres.
Students who attempt the *Branching Out* activity will have a chance to apply the concept of community to the larger world.

TROUBLE SHOOTING
- Before the pupils go outdoors to examine small communities, the format for recording information should be discussed and prepared.

VOCABULARY

community	*population*
boundary	*environment*

Activity 2:
What are some groups of living things found in your community?

TIME
one hour

SEASON
spring, summer, or fall

CLASS ORGANIZATION
pupils working in teams of two pupils to a team

EQUIPMENT AND MATERIALS
paper
pencil

SKILLS AND TECHNIQUES

- counting the populations of living things
- recording information in chart form
- working in pairs

CONCEPTS

In ecology, populations of living things rather than individual living things are usually studied.

It is difficult to count populations when the numbers are great or when the animals move about a great deal.

A change in the population of one living thing in a community can affect the populations of other living things.

SUGGESTIONS FOR VALUE TEACHING

Already in this book, you have worked individually on some activities, with a group of four or five while conducting others and as one of a pair during this activity. How do you prefer to conduct your activities?

Complete the following statements:

Individually I find that ____________________

____________________.

Working in a twosome, I find that __________

____________________.

As a member of a larger group, I find that

____________________.

How does your partner feel? Explain your reasons to each other. Do the reasons make sense?

CLUES TO QUESTIONS

The grass plants in a lawn or ants in an anthill are examples of populations that are very difficult or even impossible to count.

Populations refer to living things.

The *Branching Out* section explores the interaction of populations.

TROUBLE SHOOTING

- The pupils will have difficulty counting populations where the numbers are large or where animals move about too much. In such cases estimates will be acceptable if the difficulty is too great.
- The boundaries of the community should be clearly established for the class.

VOCABULARY

population
community

CROSS REFERENCES

Ecology in Your Community, Chapter 4.
The Dandelion, Chapter 3.

When compared with the others ____________ *seemed to get the most out of the activity.*
I would like to change the way in which I

Activity 3:
Can a piece of land have too many living things on it?

TIME

40 minutes to set up the experiment and to prepare the chart
30 minutes to discuss the results three or four weeks later

CLASS ORGANIZATION

The experiment can be done by pupils working in groups of four or five per group. The findings of each group can be compared after the experiment is completed.

EQUIPMENT AND MATERIALS

For each group:
2 identical flowerpots of soil
bean seeds
water
paper
pencil

SKILLS AND TECHNIQUES

- following the steps of an experiment
- measuring accurately
- recording information regularly and carefully
- organizing the materials for an experiment

CONCEPTS

If the animal population of a community becomes too large, the food supply will diminish.

Overcrowded plants are less likely to be healthy than plants that have adequate space in which to grow.

SUGGESTIONS FOR VALUE TEACHING

Think about how well your group worked during the experiment and complete the following statements individually:

The most helpful thing anyone did during the activity was ______________________________

______________________________.

______________________________.

We really needed someone to ______________

______________________________.

Discuss your completed statements with your group members. Each person should give reasons for his statements. On which statements is there agreement? Disagreement?

CLUES TO QUESTIONS

In general the beans that are overly crowded will not grow as well as those with adequate space. Height and health will be noticeably different.

Comparisons of the results of the different groups of pupils will provide a better understanding of the importance of space. If the results for one group are unusually different from those from the remainder of the class, a useful investigation could be conducted to find out if a "fair" experiment was carried out.

Encourage students to attempt the *Branching Out* activity. The ideas behind the bean plant experiment are useful in understanding the larger world.

TROUBLE SHOOTING

- It is very important that the pupils be careful to keep all things the same in both pots except for one thing: the number of bean seeds.
- All of the materials should be available prior to starting the experiment.
- Review the steps of an experiment before the groups begin to work.
- It may be desirable to extend the experiment to a fourth or fifth week to obtain the most visible results.

VOCABULARY

overcrowding	*overpopulation*
carrying capacity	*territory*

RESOURCES

library

CROSS REFERENCES

Small Creatures, pages 44 to 46.

4. LIVING TOGETHER

Activity 1:
What kinds of interrelationships are found in plant and animal communities?

TIME

one hour

SEASON

spring, summer, or fall

CLASS ORGANIZATION

pupils working in pairs to discover information which they then share with the entire class

EQUIPMENT AND MATERIALS

paper
pencil

SKILLS AND TECHNIQUES

- interpreting interrelationships from photography
- observing plant-animal-environment interrelationships
- working with a partner to gather information by observation
- recording information on charts

CONCEPTS

In a community there are many interrelationships involving animals, plants, and the environment.

Some relationships between two different kinds of living things are helpful to both.

Some relationships between two different kinds of living things help one but are not particularly helpful to the other.

Some relationships between two different kinds of living things help one but harm the other.

Interrelationships are important in the study of ecology.

Conditions in the environment, such as temperature and amount of sunlight, have an important effect on plants and animals.

SUGGESTIONS FOR VALUE TEACHING

Keep a diary for one day, from the time that you get up in the morning to the time that you go to bed at night. In your diary, make entries only about the things that you did that involved other people. You should carry your diary with you during the day to make brief notes so that you will not forget what happened. (Your diary is private and you don't need to share it with anyone.) When the diary is complete answer the following questions:

Mark the number of items which involved help from someone or something else. How many are there?
Which items were you able to complete without depending on anyone or anything but yourself?

What would happen to your own personal ecology if the people and things that you listed in your diary were not there?
What people depended on you during the day?
How much do you value the interrelationships that you have with the people and things in your environment?
What have you done during the day that might have made your environment a better place in which to live?
How do you feel about how you used your time during the day?

CLUES TO QUESTIONS

Our communities require service people such as police officers, dog catchers, lawyers, etc. to do specialized tasks because we cannot individually do these jobs as well, nor can we find time to be expert in all these areas.
Additional types of interrelationships are introduced in the *Branching Out* section.

TROUBLE SHOOTING

- The various interrelationships that the pupils are to examine should be located prior to the lesson so that the pupils can go purposefully from one to another to carry out their observations. All should be concentrated in an area fairly close to the school.
- Charts on which to record observations should be prepared by the pupils prior to going outdoors.
- Set a time limit for making the observations to keep the pupils working purposefully

VOCABULARY

relationship
interrelationship
producers
consumers
services
beneficial
symbiosis
commensalism
parasitism

RESOURCES

librarian
dictionary

CROSS REFERENCES

Trees
Mini-climates
Small Creatures
The Dandelion

Activity 2:
What are some interrelationships that have to do with feeding?

TIME

30 minutes

SEASON

anytime

CLASS ORGANIZATION

pupils work individually and then as a class under the guidance of the teacher

EQUIPMENT AND MATERIALS

paper
pencil

SKILLS AND TECHNIQUES

- interpreting photographs to discover producer-consumer-environment interrelationships
- completing a partially completed chart
- recalling past knowledge

CONCEPTS

Consumers are living things that use something produced by another living thing.

SUGGESTIONS FOR VALUE TEACHING

Look at the mosquito photograph on page 36. Conduct a debate with a classmate in which you are to argue whether all the mosquitoes in the world should be killed or not. One person will argue that they should be, while the other argues that this shouldn't happen. You will need to prepare *your arguments in detail so it will be useful to have a team for each side to help share the task of gathering information about mosquitoes from the library and other sources. Before the debate, both sides should agree on rules of time, presentation, etc. The teacher might be the referee.*

CLUES TO QUESTIONS

Grass can be considered a consumer because it uses things from the environment such as chemicals, water, and air.

Many plants and animals are both producers and consumers: they use things to grow and in turn become food for other living things. Students who attempt the *Branching Out* section will be introduced to predation, a specific producer-consumer interrelationship.

TROUBLE SHOOTING

- In this activity and throughout this book vocabulary is gradually introduced to the students through concrete examples: e.g., producer-consumer interrelationships. It is not sufficient to assume that the students have learned these new words only through the activities. Review and drill will be necessary so that the students internalize these words and come to use them as a part of their language of ecology. Students may be interested in making bulletin board displays, posters, etc., using these new words. A practical way to reinforce these new terms is to ask that the words be used when they are appropriate to later investigations.

VOCABULARY

producers
consumers
predators

RESOURCES

librarian

Activity 3:
How is an aquarium like an ecosystem?

TIME

one hour

SEASON

anytime

CLASS ORGANIZATION

If a number of aquariums are set up in the classroom, the pupils can work in groups of four or five to an aquarium. If only one aquarium is set up, the problems should be reviewed first and the pupils then given an opportunity to observe and find answers over a period of a day or two. The class, helped by the teacher, can discuss the results.

EQUIPMENT AND MATERIALS

For each group:
an established aquarium
paper
pencil

SKILLS AND TECHNIQUES

- distinguishing between living and nonliving things
- recognizing three kinds of interrelationships
- making and completing charts

CONCEPTS

Interrelationships in a community can exist between living and nonliving things.

Interrelationships can exist between living things and living things.

Interrelationships can exist between nonliving things and nonliving things

SUGGESTIONS FOR VALUE TEACHING

Study the photographs on page 43. Think of a caption for each photo. The captions should be short, perhaps "catchy" and tell what the photos are about. Share your captions with other classmates. What do your captions tell you about your environmental values? What do other students' captions tell you about the things that they value?

CLUES TO QUESTIONS

An ecosystem is a community of living things interacting with each other and with the environment. The aquarium is an ecosystem.

The fish can be considered a predator because it will eat its own young as well as small snails or worms that are placed in the water.

The pupils should have no difficulty in discovering evidence of the three kinds of interrelationships listed in the concept section.

The *Branching Out* section reinforces the ideas of ecosystem and balance.

TROUBLE SHOOTING

- Careful thought must be given to the interrelationships of nonliving things with other nonliving things because these are not very apparent.
- The aquarium should have been set up some time prior to the lesson and it should be in proper balance when the lesson is presented.

VOCABULARY

ecosystem
producer
consumer
interrelationship
predator

CROSS REFERENCES

Ecology in Your Community, pages 2 and 12 to 17.

Activity 4:
What kind of interrelationship can be found in plant galls?

TIME

45 minutes

SEASON

spring, summer, or fall

CLASS ORGANIZATION

teacher and class working as a unit

EQUIPMENT AND MATERIALS

For each student or pair of students:
page 44 of student book

SKILLS AND TECHNIQUES

- interpreting photographs
- recognizing some kinds of galls
- interpreting the main idea of the nature poem

CONCEPTS

Galls are usually swellings found on the leaves, stems, and other parts of plants.
Galls are places where an insect lives and grows.
A gall is a parasite obtaining food and shelter from a plant without returning anything to it.

CLUES TO QUESTIONS

This lesson should be handled as an appreciation lesson in which the students are encouraged to speculate about the gall.

VOCABULARY

gall
parasite
parasitism

Activity 4(a):
Where can you find galls in your community?

TIME

one hour

SEASON

early fall

CLASS ORGANIZATION

a class excursion to areas around the school; pupils work in small groups of two or three to observe and collect galls

EQUIPMENT AND MATERIALS

For each group:
plastic bag
galls
paper
pencil

SKILLS AND TECHNIQUES

- collecting galls
- observing galls in their natural environment
- identifying differences in galls
- completing a chart

CONCEPTS

Galls can be found on almost all parts of a plant.
Galls can often be found in great numbers on leaves and twigs.
Galls come in all sizes, shapes, textures.

SUGGESTIONS FOR VALUE TEACHING

Part of this activity requires you to count the number of galls on each plant. You have probably noticed that numbers occur often in science experiments. Have you ever wondered why words such as "a few", "many", and "lots" are not used instead of numbers? On the following scale Olive uses numbers whenever possible. She is so objective about what she does that she numbers her pet gerbils rather than give them regular names. Sally dislikes anything with numbers in it. She is so subjective that when her mother asks when she will be home, she answers, "after school" or "after a while" rather than give an exact time.

How do you feel about the use of numbers in your activities? Mark your position on the scale.

Objective Olive	Subjective Sally

Compare your position with the positions of your group members.

CLUES TO QUESTIONS

Galls will usually be found in quite open spaces where it is sunny.
The same type of gall can vary in size (within limits) but keep a constant shape.

TROUBLE SHOOTING

- The teacher should survey the area carefully to locate places where galls can be found in large numbers. Sometimes galls will be very abundant and at other times they will be quite scarce. This lesson can be useful even if the variety of galls is limited. Goldenrod galls are generally the easiest to find.
- The chart should be prepared prior to starting the excursion.

VOCABULARY

galls

Activity 4(b):
What is inside a gall?

TIME

45 minutes

SEASON

early fall

CLASS ORGANIZATION

The pupils should work in pairs at their desks and later discuss their findings with the entire class.

EQUIPMENT AND MATERIALS

For each group:
sharp knife or taped razor blade
galls
magnifying glass
pencil
paper

SKILLS AND TECHNIQUES

- using a sharp instrument safely
- dissecting a number of different galls
- using a hand magnifier to observe carefully
- recording fings on a chart

CONCEPTS

The gall is a swelling caused when an insect gives off a chemical in a part of a plant. The chemical makes the plant grow faster around the insect creating the swelling or gall.
The insect inside a gall is a parasite of the plant on which the gall is found.

SUGGESTIONS FOR VALUE TEACHING

This activity requires you to come close to creepy crawlers (insect larvae). How do you feel about being close to animals? Mark your position on the following scale.

Handle Harry carries his pet creatures around in his pockets.	Leave-Alone Larry refuses to be in the same room as a creepy crawler.

Compare your mark and your reasons with your partner's response.

CLUES TO QUESTIONS

In most galls the students will find the actual insect or evidence that an insect was there at one time.

Newly-formed galls often have thick walls. An insect will often make a tunnel to the surface of the gall when it is ready to leave the gall.

The insect inside the gall lives in a complete world for a while. It has both food and shelter.

Some galls will have little doors whereby the insect can leave at any time. Others have no doors and the insect remains inside until it has matured.

TROUBLE SHOOTING

- The pupils should be shown the proper way to use a sharp knife or razor blade for dissecting so as to avoid injuries.
- If double-edged razor blades are used, one edge should be taped.

VOCABULARY

galls
larva
pupa

RESOURCES

library books

CROSS REFERENCES

Small Creatures, Chapter 2.

Activity 4(c):
What types of insects cause galls?

TIME

45 minutes for identification of galls
periodic observations for four to six weeks to find out what insects emerge from the galls

SEASON

early fall

CLASS ORGANIZATION

Individual pupils or small groups of pupils who are particularly interested should set up the gall insect traps. All of the pupils should observe as many different gall insects as possible and discuss with the entire class the reasons for identifying the insects as a particular type.

EQUIPMENT AND MATERIALS

For each group:
galls
nylon net
dish
water
stones

SKILLS AND TECHNIQUES

- using a hand magnifier to observe carefully
- observing gall insects to recognize the different types
- using a guide to identify insects as one of four types
- setting up traps to catch gall insects by following the directions in the diagram

CONCEPTS

Most galls are caused by insects.

Flies, moths, aphids, and moths can cause galls.

Each kind of insect makes a different shape and size of gall.

Galls can be grouped into four main types.

SUGGESTIONS FOR VALUE TEACHING

Not all scientific studies can be completed in thirty to sixty minutes. Some experiments such as waiting for insects to emerge from a gall take days or even weeks to complete. Actually, some scientists spend years on one experiment. How do you feel about activities that take a long time to complete? What attitudes are necessary if a person is to be successful during a long-term activity? Are these attitudes ones that you value?

CLUES TO QUESTIONS

Birds and other animals often attack galls and eat the insect living inside.

The downy woodpecker is a predator that eats the insect in the gall.

The woodpecker has a powerful beak to enable it to open the gall.

Students who attempt the *Branching Out* section will enrich their knowledge of galls and enjoy creating things from galls.

TROUBLE SHOOTING

- This activity should follow immediately after 4(b) in which the galls were dissected. If some time has elapsed, additional galls collected in *Activity 4(a)* should be dissected to observe the insects.
- It may require up to six weeks or longer before some gall insects will emerge from the galls.

VOCABULARY

larva
aphid
oak apple
antenna

RESOURCES

librarian

Activity 5:
Where does your food come from?

TIME

one hour

SEASON

anytime

CLASS ORGANIZATION

Pupils work individually at their desks and later have an opportunity to present some of their work to the entire class.

EQUIPMENT AND MATERIALS

magazines
newspaper
scissors
paper
pencil

SKILLS AND TECHNIQUES

- drawing pictures to show the links in the food chain
- examining newspapers and magazines for pictures of food
- making and completing a chart showing food chains

CONCEPTS

A food chain is one set of producer and consumer relationships within a group of living things. It shows the chain from the original producer to the final consumer. The sun is the original producer in most food chains.

SUGGESTIONS FOR VALUE TEACHING

Complete the following sentences.

If I could correct one ecological problem I would choose ______________________________
____.

All of the attention paid to ecology in newspapers and on television is __________
____.

The government's laws about the environment should ________________________________
____.

People who seriously change natural food chains are ______________________________
____.

Discuss your completed sentences with some of your classmates. What do your completed sentences show about your environmental values? Can you determine your classmates' values from their sentences?

CLUES TO QUESTIONS

The pupils can develop their own charts showing a number of food chains. Some of their work should be selected and made into a large class chart.

Each step in the food chain can be called a link because it ties together, through its relationships, the step before and the step after.

The *Branching Out* section contains short activities that highlight more intricate natural food chains.

TROUBLE SHOOTING

- Pictures can be collected at home prior to the lesson. Additional magazines and newspapers should be available in the classroom for additional pictures.

It is best to first study common foods that can be traced easily back to the source. If the pupils wish to explore more exotic favorite foods they may have to consult their parents and others or refer to books in the library.

VOCABULARY

advertisement
menu
source
food chain
link

RESOURCES

librarian
parents and adults

Activity 6:
What happens when you are a link in many different food chains?

TIME
one hour

SEASON
anytime

CLASS ORGANIZATION
Pupils work individually at their desks and then discuss their work with the entire class.

EQUIPMENT AND MATERIALS
paper
pencil

SKILLS AND TECHNIQUES
- inferring and reasoning as a way of answering questions
- completing a partially completed chart

CONCEPTS
Different food chains overlap because plants and animals in one chain also depend on plants and animals in another chain.
Overlapping food chains are called food webs.
The sun is the most important member of any food web.

SUGGESTIONS FOR VALUE TEACHING

Have a small group discussion to resolve the following problem. (Try to reach consensus, that is, everyone agreeing with the decision without voting or agreeing just to go along with everyone else.)

It is costly in time, energy and money for a city to maintain grass in public places. Therefore, all the open areas should be asphalt.

CLUES TO QUESTIONS
Completing the chart can be a challenging exercise for the pupils. Can they think of an animal that eats honey, berries and fish and that might also be at the end of a number of food chains?
In discussing the least important member of the food web there is considerable scope for differences of opinion. The value of the discussion is the thinking process that the pupils go through to reach a logical explanation for their choices.

Students who attempt the *Branching Out* section will gain further insights into natural food webs.

TROUBLE SHOOTING
- This activity provides much opportunity for speculation and reasoning. The teacher should avoid rushing the pupils to reach the "right" answer.
- A large chart should be prepared before the lesson and should be completed during the discussion session.

VOCABULARY

food web
food chain
erosion
insecticides
overcutting

RESOURCES
librarian

5. SPECIAL FEATURES

Activity 1:
How are some plants and animals suited to live in their environment?

TIME
one hour

SEASON
spring, summer or fall

CLASS ORGANIZATION
Pupils work in groups of three or four to observe pairs of animals and plants outdoors in the school neighborhood. This is followed by a class discussion.

EQUIPMENT AND MATERIALS

For each group:
adhesive tape
paper
pencil

SKILLS AND TECHNIQUES

- setting up a simple experiment in which pupils try to do normal tasks without the use of their thumbs
- observing differences between pairs of animals and plants that are somewhat alike
- inferring how certain adaptations affect living things
- making and completing a chart

CONCEPTS

An adaptation is a change in the structure or habits of a living thing that allows it to live better in its environment.

All animals and plants have developed certain features that enable them to survive in their environment.

SUGGESTIONS FOR VALUE TEACHING

Think of what conditions might be like on earth in the year 2500. How will people have to change so as to be able to survive in these conditions? Draw pictures of a family to show the special features that will have developed over the centuries. Be prepared to state a reason for each special feature. What do these special features show about the things that people value?

CLUES TO QUESTIONS

This activity is another one that will encourage the pupils to think.

Give the pupils an opportunity to reflect on a number of the adaptations each living thing being observed possesses. Let them speculate on how these adaptations affect the living thing.

The adaptation that the pupil finds most significant should be recorded. Since they cannot actually see in all cases how the adaptation is used, the pupils will have to infer the uses. The pupils should also be encouraged to refer to library books for additional information on adaptation.

TROUBLE SHOOTING

- There should be no difficulty in finding similar pairs of plants in the school neighborhood. Since pairs of animals may not be available when wanted, it is wise to collect some prior to the experiment.

VOCABULARY

features
adaptation

RESOURCES

librarian

Activity 2:
Do different plants and animals live in different conditions?

TIME

one hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

Pupils work outdoors in groups of four or five to examine a number of areas.

EQUIPMENT AND MATERIALS

For each group:
a coat hanger formed into a square
paper
pencil

SKILLS AND TECHNIQUES

- counting accurately the populations of plants and animals
- inferring why plants and animals live in particular areas
- working in groups
- completing a chart

CONCEPTS

The plants and animals in two areas will be different if conditions such as temperature, amount of moisture, and amount of sunshine are different.

SUGGESTIONS FOR VALUE TEACHING

Work by yourself to complete the following items.

On the whole, I think the activity was conducted

very poorly	poorly	not so well	ok	well	excellently

The strengths of the investigation were

____

______________________________________.

The weaknesses of the investigation were

____

______________________________________.

The activity would have been better if we had ______________________________.

______________________________________.

During our next study I would like to see us

____

______________________________________.

Discuss your completed statements with your group members. Try to give reasons for each of your opinions.

CLUES TO QUESTIONS

Discuss the *Digging Deeper* questions with the pupils before they go outdoors. Encourage the pupils to speculate on some of the *Digging Deeper* questions to which answers cannot be directly observed. For some special adaptations guide interested students to the *Branching Out* section.

TROUBLE SHOOTING

- Have the groups prepare the chart in the classroom before going outdoors.
- Each group should determine the responsibility of each group member before working outside.
- Locate the areas to be observed before the pupils go outdoors.

VOCABULARY

pitcher plant
diving beetle

RESOURCES

librarian

CROSS REFERENCES

The Dandelion, Chapter 3.
Mini-climates, all chapters.

Activity 3:
What are some ways that a fish is adapted to live in a water environment?

TIME

an hour or more

SEASON

anytime

CLASS ORGANIZATION

pupils working in groups of four or five at their desks

EQUIPMENT AND MATERIALS

For each group:
hand lens
guppies, goldfish, or large minnows
aquarium
fish food
paper
pencil

SKILLS AND TECHNIQUES

- observing a fish
- inferring the special uses of a fish's special features
- comparing a fish with a person
- completing a chart

CONCEPTS

The body structure of the fish makes it well-suited to a water environment.
The streamlined shape of the fish enables it to move easily through water.

SUGGESTIONS FOR VALUE TEACHING

Think of a polluted pond or lake and look at the diagram of the fish on page 59. The polluted water is murky with floating waste, lacks oxygen, has a foul smell and is covered with slimy, green algae. If this fish is to survive in its environment what special features will it have to develop? Use your imagination and redraw the fish complete with the adaptations that it might develop over several generations. Give your fish a new name. Compare your "evolved fish" with the ones created by your group members. Be prepared to suggest a reason for each adaptation. After your sharing session, lead a group discussion on what students in your class can do to avoid the necessity for this type of evolution.

CLUES TO QUESTIONS

When answering the *Digging Deeper* questions, the pupils should refer to their chart. Some goldfish should be readily available for further observation to verify what was seen earlier.

This activity is excellent as a means of having the pupils infer the use of the special body features of the fish. Some reference to library will be necessary to answer some of the questions.

Students who explore the *Branching Out* section will gain insights into other special adaptations.

TROUBLE SHOOTING

- If care is exercised, a goldfish can be observed more closely by removing it from the water and placing it on a piece of wet towelling. The head of the fish should be covered with wet paper towelling also. The fish should be kept out of the water for only a very few minutes. Avoid touching the fish unnecessarily with your hands.

Provide each group of four or five pupils with a fish for observation. It is better to provide more than one kind of fish for the class to study so that similarities and differences among fish can be more readily learned.

VOCABULARY

lateral line
nostril
gill

RESOURCES

librarian

CROSS REFERENCES

Ecology in Your Community, pages 12 to 17 and pages 42 to 43.
The Dandelion, Chapter 2.
Small Creatures, Chapter 5.

Activity 4:
How does color adaptation help some animals live in their environment?

TIME

one hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

pupils working in groups of six or eight on the school lawn

EQUIPMENT AND MATERIALS

For each group:
100 toothpicks - 25 white, 25 red,
25 blue, 25 green
aquarium
paper
pencil

SKILLS AND TECHNIQUES

- predicting the number of toothpicks that can be found in ten minutes
- making a bar graph
- studying photographs to discover camouflage adaptation
- observing carefully
- completing a chart

CONCEPTS

Colors that are in bright contrast to the surroundings stand out vividly.

Colors that are the same as their background cannot be easily distinguished.

Camouflage is the way in which a living thing appears to blend into its surroundings and hides itself.

Many animals make use of camouflage.

People sometimes make use of camouflage.

SUGGESTIONS FOR VALUE TEACHING

Use some construction paper and crayons or pastels and design a bug that you think will be able to survive in its environment. Place it in its habitat and challenge a classmate to find it. Describe the purpose of each feature designed. Which feature did you feel was the most important?

CLUES TO QUESTIONS

The bar graph shows in a vivid way the toothpicks that are most visible in the grass and those that blend in best and so are difficult to find.

The ten-minute time limit is a reasonable length of time for the pupils to conduct the search.

The *Branching Out* section has many simple suggestions for reinforcing the understanding of camouflage as a special feature.

TROUBLE SHOOTING

- Have each group organize its activities carefully before going outdoors so that each member will be thoroughly acquainted with what he/she is to do.
- The toothpicks should be prepared a day or two before this activity.
- The toothpicks should be scattered over an area of grass sufficiently large to make it a challenge to find the toothpicks but not so large that very few are found.
- The teacher might test the activity himself to determine the difficulty in finding the toothpicks.
- The chart would be prepared before the pupils go outside.
- The steps in making a bar graph should be reviewed before the pupils start to work on it.

VOCABULARY
camouflage
reverse camouflage
pollination

RESOURCES
librarian

6. DIFFERENCES

Activity 1:
How are animals of the same type different?

TIME
40 minutes to observe, record and discuss differences among the pupils
30 minutes to discuss the data collected from the observations

SEASON
anytime

CLASS ORGANIZATION
The pupils can work in school as individuals and note differences in their classmates. Outside school they can note the differences among dogs.

EQUIPMENT AND MATERIALS
paper
pencil

SKILLS AND TECHNIQUES

- identifying differences between people
- identifying differences among animals of the same type
- completing a chart

CONCEPTS
No two people, animals, or plants are exactly alike.
How living things of one type are different from one another is called variation.
Variation enables us to distinguish between two living things of the same type.

SUGGESTIONS FOR VALUE TEACHING

In choosing a close friend what, in your mind, are the most important factors to consider? Rank order the following characteristics:

Appearance	*Color*
Size	*Sex*
Personality	*Popularity*
Intelligence	

Discuss your ordering of these qualities with some of your classmates. Can you find someone who has a similar list? What values do you share?

CLUES TO QUESTIONS
Pupils should make use of the library to answer some of the questions in the *Digging Deeper* section.

TROUBLE SHOOTING

- When discussing the differences among people, be sensitive to situations in which physiological and personality differences may result in stereotyping by reason of ethnic, racial and sex comparisons. In dealwing with these cases, similarities should be seen to be as important and worthy of consideration as are variations. In other words, to be different is not the same as to be wrong.

VOCABULARY

variety
variation

RESOURCES

librarian

CROSS REFERENCES

Your Senses, all chapters.

Activity 2:

How can plants of the same type in the same community be different from one another?

TIME

one hour

SEASON

spring, summer or fall

CLASS ORGANIZATION

Pupils work in groups of five or six outdoors to study the leaves of one type of plant in the community.

EQUIPMENT AND MATERIALS

For each group:
hula hoops
string
popsicle sticks
plastic bags
water
paper
pencil

SKILLS AND TECHNIQUES

- organizing a sampling technique
- comparing sampling techniques
- ordering leaves according to size
- working outdoors
- tracing leaves

CONCEPTS

Plants of the same type living in the same community are different from each other in many ways.

A properly-used sampling method aids one in fairly selecting representative plants of one type.

Leaves on plants vary in size.

SUGGESTIONS FOR VALUE TEACHING

Think of what happened during the activity and complete the following statements working by yourself.

Of the things people did, I admired ____.

I was somewhat surprised that ____.

It really hindered our progress when ____.

I felt the group didn't treat ____________ *very fairly.*

Discuss your completed statements with your group members. On which points is there agreement? Disagreement?

CLUES TO QUESTIONS

Each group of pupils can attempt a different sampling method. A comparison of results will help them to determine if one method is better than another.

If each group selects a different type of plant, the pupils will be more impressed with the fact that plants of a type living in the same community are different.

TROUBLE SHOOTING

- Efforts should be made to make a random selection of plants while sampling. This will produce the fairest results.
- If a hula hoop is used, the pupil should throw it back over his/her shoulder without aiming at a specific spot.
- Before the lesson begins the popsicle sticks should be numbered in preparation for the samplings.
- The number of plants and the number of leaves to be studied, as suggested in the book, is arbitrary but it is necessary to establish a limit that is workable and yet provides reliable results.
- Each group should determine the sampling method and the plant to be studied before going outdoors.

VOCABULARY

sampling

RESOURCES

librarian

CROSS REFERENCES

Trees, Chapter 6.
The Dandelion, Chapter 2.

Branching Out:
What other kinds of plant differences could you investigate?

TIME
one hour

SEASON
spring, summer or fall

CLASS ORGANIZATION
Pupils work outdoors in groups of five or six to study a selected difference that appears to exist between plants of the same type.

EQUIPMENT AND MATERIALS
For each group:
hula hoops
string
popsicle sticks
plastic bag
water
cardboard
paper
pencil

SKILLS AND TECHNIQUES
- discovering differences in plants of the same type living in the same community
- inferring causes of plant differences
- developing a class chart
- recording information on a chart

CONCEPTS
Plants of the same type living in the same community are different from each other in many ways.

SUGGESTIONS FOR VALUE TEACHING
Study the photographs on page 68. Think of an appropriate caption for each one. What do your captions indicate about your environmental values? Show a classmate your captions and ask him/her to decide from them the things that you value. Do you agree?

CLUES TO QUESTIONS
So as to better understand the differences between plants of one type, the pupils can be encouraged to examine all of the differences observable among the five plants selected and chart the results.

TROUBLE SHOOTING
Same as *Activity 1.*

RESOURCES
librarian

CROSS REFERENCES
Trees, Chapter 3.
Mini-climates, all chapters.

7. TIME BRINGS CHANGES

Activity 1:
How do communities change?

TIME
one hour

SEASON
spring, summer or fall

CLASS ORGANIZATION
Pupils work in groups of three or four on the asphalted areas of the school grounds or in the school neighborhood.

EQUIPMENT AND MATERIALS
For each group:
coat hangers
ruler
Plasticine
jar of water
pencil
paper

SKILLS AND TECHNIQUES

- estimating the age of asphalt
- comparing asphalt as observed with photographs of asphalt
- counting cracks and plants
- measuring the width of asphalt cracks and height of plants
- making Plasticine prints
- inferring how plants and freezing water affect asphalt
- interpreting photographs to discover the changes brought about by time
- completing a chart

CONCEPTS

The changes that take place in a community over a long time are called succession.
Asphalt changes with time.
As asphalt gets older, it becomes lighter in color and develops cracks.
Freezing water and plants break up asphalt over a period of time.
The environment is always undergoing change.

SUGGESTIONS FOR VALUE TEACHING

Read the cartoon on page 74. What changes are likely to happen in Charlie Brown's and Linus's lives? What major changes will probably come about in your lifetime? How do you feel about these changes? Mark your position on the following scale.

Stay the Same Stella — Changing Chiquita

What does your position show about your values?

CLUES TO QUESTIONS

The pupils should be encouraged to refer to library books to find out how rocks are broken down over a period of time.
The pupils can ask adults in the neighborhood when asphalt was placed in order to get accurate information on the age of the asphalt.
The *Branching Out* section explains how succession changes the environment.

TROUBLE SHOOTING

The pupils must use their measuring skills carefully when measuring the widths of the cracks because some of the cracks in newer asphalt are very narrow. The width of cracks should be measured in millimetres.

The jar is placed in a paper or plastic bag to reduce danger from broken glass.

Locate areas of asphalt of differing ages prior to the lesson.

VOCABULARY

succession
asphalt

RESOURCES

librarian
local adults

Activity 2(a)
How does dead plant and animal life in your community change from day to day?
What happens to lawn cuttings?

TIME

45 minutes over a two-day period

SEASON

spring, summer or fall

CLASS ORGANIZATION

Pupils work in groups of three or four at their desks and on the school lawn.

EQUIPMENT AND MATERIALS

For each group:
lawn cuttings
balance
newspaper
bag
pencil
paper

SKILLS AND TECHNIQUES

- using a balance
- observing the change in grass cuttings
- inferring what eventually happens to grass cuttings
- completing a graph

CONCEPTS

Grass cuttings decay and become part of the soil.
Grass cuttings dry up and wither soon after they are cut.

SUGGESTIONS FOR VALUE TEACHING

Survey a number of people about their attitudes toward decaying or rotting material. Your sample might include adults as well as students. What is the general opinion that people have? What reasons could you give to support that decay is an important aspect in the life cycle and without it, new life would not be possible? How do you feel about decaying matter?

CLUES TO QUESTIONS

The pupils might find the mass of the grass cuttings several times while they are drying out so as to find the rate at which the mass is decreasing.

Have the pupils read to find out how humus is formed. What is humus?

The *Branching Out* section contains other simple activities that demonstrate how change takes place.

TROUBLE SHOOTING

- The pupils should wash their hands carefully after handling worms to reduce the possibility of catching diseases.
- Care should be taken not to lose any grass cuttings while they are drying out.

VOCABULARY

decay

Activity 2(b):
What happens to fallen apples?

TIME

45 minutes (a few minutes each day over several days)

SEASON

spring, summer or fall

CLASS ORGANIZATION

pupils working groups of three or four per group

EQUIPMENT AND MATERIALS

For each group:

apple
sharpened stick
paper
pencil

SKILLS AND TECHNIQUES

- making and recording observations

CONCEPTS

Fallen apples change rapidly.

Fallen apples are eaten by animals; they rot and they dry up.

SUGGESTIONS FOR VALUE TEACHING

Read the following paragraph. On your second reading mark a plus (+) over each phrase or sentence with which you agree. Place a minus (-) over each one with which you disagree.

"Rotting things are rotten. They give off horrible odors and attract beastly creatures. Some ecologists think that these dirty animals are Nature's Sanitation Squad and that they break down dead material. Nonsense! In reality they are disease-laden, offensive pests that should be destroyed. People that allow such conditions to exist around their homes as to permit these creatures to live should be severely punished. Cleanliness is next to godliness!"

Compare your coded papers with those of other members in your group. Discuss the reasons for your coding. What do you think are the values of the author? What changes would you make in the paragraph? What are your values on this topic?

CLUES TO QUESTIONS

If the apple is placed on a stick it will be easier to find and it won't be carried away as readily by an animal.

The *Branching Out* section suggests a similar activity for interested students.

TROUBLE SHOOTING

- The apple should be placed where it will not be disturbed by other people.

If the apple is placed near a pupil's home, he can observe it at night with a flashlight and detect visitors, if there are any.

VOCABULARY

Nature's Sanitation Squad

RESOURCES

librarian

CROSS REFERENCES

Birds, page 60.

Activity 2(c):
What effect do air and water have on what happens to food?

TIME
30 minutes

SEASON
anytime

CLASS ORGANIZATION
class working as a group

EQUIPMENT AND MATERIALS
pieces of stale bread
pieces of dried orange peel
plastic bags
string or elastic bands
moist paper towels

SKILLS AND TECHNIQUES

- conducting an experiment
- inferring interrelationships
- inferring conditions that help molds to grow
- using a microscope (one with a low power of magnification, e.g., 15X to 40X)

CONCEPTS
Plants or animals that cause dead matter to decay are called decomposers.
Moisture and air speed up the decay of food.

SUGGESTIONS FOR VALUE TEACHING

Think about what you did during the activity, and complete the following sentences:
During the activity, I agreed mostly with what was said by ____________________________
____.
It was disappointing to me that __________
____.
I felt that I did not do a very good job at
____.
I had a feeling of accomplishment when I
____.

What do your completed statements show about what you value when you conduct an activity?

CLUES TO QUESTIONS
Encourage the pupils to read library books so as to find out more about molds and the part they play in decay.
Have the pupils devise other experiments to test conditions that help mold to grow, e.g., warmth and cold.
Students who attempt the *Branching Out* section might apply the concepts of decomposition to conditions in the neighborhood community.

TROUBLE SHOOTING

- Several days must be allowed for molds to grow so that students can observe the decomposition of the matter. Filmstrips, films and/or library books might be borrowed from the library to find out what is taking place. Collecting and interpreting this kind of secondhand information can be conducted while the molds are growing.

VOCABULARY
mold
decompose
recycling

RESOURCES
librarian

CROSS REFERENCES
Pollution, Chapter 2.

Activity 3:
How does a piece of bare ground change over several weeks?

TIME
two hours - the time is spread over a two-month period or longer

SEASON
spring, summer, or fall

CLASS ORGANIZATION
Interested pupils work in groups of four or five and present their findings to the entire class.

EQUIPMENT AND MATERIALS
For each group:
shovel or spade
hula hoop
string
paper
pencil

SKILLS AND TECHNIQUES

- mapping a plot of ground
- measuring plant sizes

CONCEPTS

Even over a period of weeks a piece of bare ground will change noticeably.

SUGGESTIONS FOR VALUE TEACHING

Study the photograph on page 34 and then read the following poem by Ogden Nash.

Song of the Open Road
I think that I shall never see
A billboard lovely as a tree
Indeed, unless the billboards fall,
I'll never see a tree at all.

Conduct a role-play situation in which Mr. Nash visits the offices of Environment Canada to complain about the billboard. What will Mr. Nash say? How will the Wildlife Service official answer him? Ask members of the class to suggest which one they think is right. What values are shown by the student who acts as Mr. Nash? What values are shown by the student who acts as the government official?

TROUBLE SHOOTING

- It is essential that the pupils observe the same area each time. The hula hoop provides a reasonable amount of area to be studied. Four small stakes can be placed in the ground position north, south, east and west to assure that the area is being observed in the same way each time.
- As an alternative to recording the changes on one map, a series of maps can be prepared; one for each week when observations are made.
- Select a fairly untravelled secluded area to reduce disruption of the activity by people.
- The long-term nature of this activity may require special effort to maintain high interest if the whole class is involved.

CROSS REFERENCES

The Dandelion, Chapter 5, Activity 8.
Small Creatures, pages 44 to 46.

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Pollution
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Snow and Ice
Trees
Your Senses

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